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COMMANDERS DIGEST

HOW DoD CAN STRETCH THE MAINTENANCE AND LOGISTIC DOLLAR WITH PRAM

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SQUEEZING SOME LIFE OUT OF OBSOLESCENCE

The new approach to problems of obsolescent avionics equipment, spiraling maintenance and logistic support costs is best symbolized by the acronym, "PRAM" (Pragmatic, Reliability, Availability and Maintainability).

It is not necessary, however, to dwell at any great length on the problems. It is a fact that our defense systems are aging; that we are making them last longer than anyone expected when they were designed; and that maintenance and logistics support costs are taking a large and increasing fraction of the Department of Defense budget. As anyone who has tried to get replacement tubes for a 1955-vintage television set knows, life extension programs must move with current technology and available parts simply because many of the parts we need are found only in museums.

Therefore, it is not the problems, but the approach to meaningful solutions, that is of concern.

OSD Reorganization

Before getting into the main points I would like to outline some of the recent changes that have occurred in the organization of the Office of the Secretary of Defense, as they relate to this subject.

Several months ago the Director of Defense Research and Engineering was designated as the DoD acquisition executive, thereby integrating with the research and engineering functions those specific procurement and production activities previously assigned to the Assistant Secretary of Defense for Installations and Logistics. Recently, the incumbent director, Dr. William Perry, was sworn in as the first Under Secretary of Defense for Research and Engineering. Dr. Perry has consolidated the acquisition policy functions—including procurement, production and standardization—under his new Deputy Under Secretary for Acquisition Policy, Dale Church. I work for Mr. Church as his Director for Material Acquisition Policy. Among other functions, I am responsible for the defense industrial base, production management, standardization, quality assurance, reliability and maintainability. Since I have always believed that these activities suffered some lack of visibility in the engineering community, I am convinced that the closer relationships embodied in the reorganization will have a very beneficial impact on their accomplishment during all phases of material acquisition.

Additionally, these actions mean there will be more unified and higher level attention to the entire acquisition process, from the first statement of mission needs to operational deployment of new systems.

By Floyd H. Trogdon
Director, Office of Material Acquisition Policy
(ODUSDR&E)

Further, involvement of the acquisition executive will not terminate abruptly at operational deployment. It has become increasingly apparent that our responsibility must follow systems far enough into field service to make sure they meet their approved performance and operations and support (O&S) cost objectives. It has also become apparent that acquisition policy must address product improvement and life extension programs as well as the initial development of new systems. The same kind of integrated, high level attention is needed in both cases to ensure maximum return on cost and schedule investment, in terms of delivered performance and minimum O&S cost.

OSD View of PRAM

The PRAM concept is of significant interest to the Office of the Secretary of Defense. The Air Force is quite interested in improving the reliability and maintainability of its operational systems for the particular purpose of reducing maintenance and logistics support costs. It is impressive that most, if not all, PRAM projects are selected to provide a five-to-one return on investment within five years. That is just what we are trying to achieve in research, development, production, reprocurement and life extension programs—a higher return on cost and schedule investment.

Some of the largest and most promising PRAM projects are being conducted at Warner-Robins Air Force Base, Ga. The update of the F-106 attitude, heading and reference system not only uses modern, off-the-shelf technology but also achieves significant reductions in size, weight, number of components and projected O&S cost. The same approach is being taken to update the fire control system for the B-52 tail turret.

In both of these projects, I have noted the emphasis on "form, fit and function" replacement to avoid having to retrofit the rest of the aircraft, and the use of solid state components to replace those now ancient vacuum tubes. Specific attention to such precepts is what we must have in order to extend the useful life of inventory systems and equipment, retain their operational effectiveness and reduce their operational and support cost. We will be seeing more and more life extension programs, and I am pleased to see that PRAM is taking this approach from the start.

I do not think anyone can honestly throw rocks at the people who originally designed and built that F-106 and B-52 equipment. The technology in that equipment is more than 20 years old; we have, and certainly should have learned a few things in 20 years. Thus, these PRAM projects are not designed to bail out an incomplete development program or correct deficiencies that should have been found before the equipment was produced.

DEFENSE NEWS BRIEFS

New Frigate Class

The first ship of a new class of guided missile frigates, Oliver Hazard Perry (FFG-7), was commissioned in December 1977 at Bath, Maine.

The 445-foot long ship is powered by gas turbine engines at speeds of more than 28 knots.

Armed with surface-to-surface missiles, surface-to-air missiles, a new model 76mm rapid-fire gun, anti-submarine torpedoes, and helicopters, the Perry and her sister ships are designed primarily to protect merchant shipping and amphibious forces against air, surface and submarine attack.

ELF Sub Communications Test Facility Planned

Navy filed its Final Environmental Impact Statement in December 1977, recommending the location of an extremely low frequency (ELF) communication test facility in the upper Peninsula of Michigan near Marquette and to operate it in conjunction with an existing facility in Wisconsin.

ELF would give the Navy a new operational capability, the means to communicate with submarines while submerged. Currently, submarines must risk detection and come near the surface to receive messages.

Army Announces Reserve Recruit Program

Army announced in December 1977 a pilot program for the U.S. Army Recruiting Command (USAREC) to assist the U.S. Army Reserve (USAR) in recruiting Reservists.

The pilot program will be established at the Syracuse, N.Y., District Recruiting Command (DRC), with active force DRC recruiters coming under the operational control of USAREC management structure.

Army said it took the initiative to improve USAR unit readiness and strength and to allow USAR commanders to devote more time to operational and readiness functions.

Military Strength Announced

	Nov. 30, 1977 preliminary	Oct. 31, 1977	Nov. 30, 1976
Total DoD	2,068,721	2,072,434	2,082,173
Army	778,246	780,008	780,935
Navy	527,138	528,412	530,713
Marine Corps	191,913	192,675	188,944
Air Force	571,424	571,339	581,581

The figures represent full-time military personnel comprising both Regulars and Reserves on continuous active duty and officer candidates including cadets at the Military and Air Academies and Midshipmen at the Naval Academy.

Women Can Serve At Brigade Level

Army has a new policy allowing women to serve in any officer or enlisted specialty at any organizational level except battalion size and smaller units of Infantry, Armor, Cannon Field Artillery, Combat Engineer, Low Altitude Air Defense Artillery units, and Special Forces.

The new combat exclusion policy will allow women to be assigned to brigade level headquarters, except for closed job specialities, Hawk and Hercules air defense units and Lance missile artillery units.

Opening 14 more enlisted specialties to women, the new policy now leaves closed only 16 of 377 total job specialities.

Army Doctor Shortage

Army has convened a review committee to examine ways to alleviate the current doctor shortage.

The committee, headed by Army's Surgeon General, Lt. Gen. Charles C. Pixley, will examine a number of proposals including effective use of medical personnel, increasing the number of physicians, and updating and creating a physician incentive program.

Advanced Tanker/Cargo Aircraft Selected

McDonnell Douglas Corporation of Long Beach, Calif., has been selected as the primary contractor for the Advanced Tanker/Cargo Aircraft (ATCA) mission. McDonnell Douglas was awarded $28 million to start production engineering, tooling, and other non-recurring activities.

Quantities of the aircraft to be funded over the next five years will be determined by available funding.

It is expected that approximately 20 DC-10-30CF Advanced Tanker/Cargo Aircraft could eventually be ordered by the Air Force.

In one way, however, the Research and Development (R&D) community is and should be trying to put PRAM out of business . . . by designing, developing and delivering systems so reliable and so maintainable that future PRAM program offices will find they have nothing to do.

We are working in that direction, and we are using many of the principles by which PRAM operates, but trying to put PRAM out of business is a little like trying to achieve the ideal score in the game of golf. The ideal score in golf is one stroke per hole . . . and no golfer can ever be completely satisfied until he makes that hole-in-one every shot because, until he does, he can always do better.

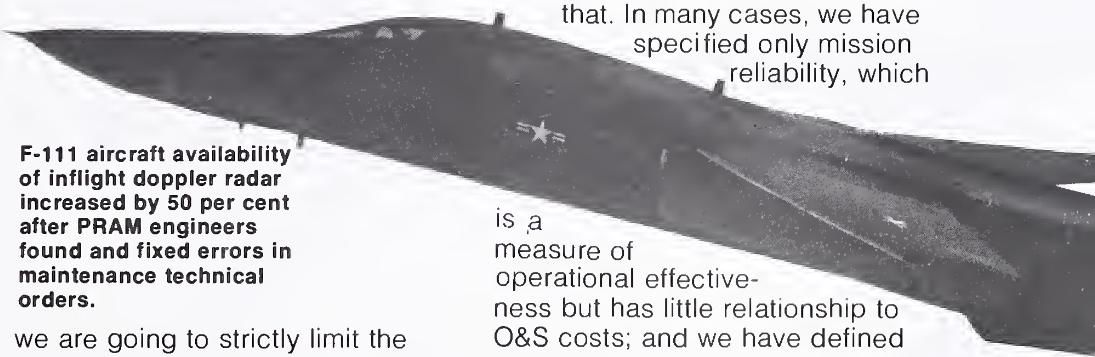
So, yes: we are going to do everything we can to cut down the volume of problems that present and future PRAM programs will have to work on. But no: the time will never come when research and development is so perfect that we no longer need to improve the reliability, availability and maintainability of deployed systems and equipment.

As a matter of fact, we are using much of the PRAM approach in our new DoD directive on reliability and maintainability. Not just the detailed "lessons learned," but the approach itself.

Some aspects of the new DoD policy on reliability and maintainability will pose challenges for PRAM and the programs like PRAM that we are moving toward starting in the other military departments.

For example, we are serious about having realistic test and evaluation before commitment to production. While some improved subsystems and equipment can be tested in their operational environment, others will have to make use of the combined environmental/reliability test (CERT) concept now being sponsored by the PRAM program office at Wright-Patterson Air Force Base, Ohio. The CERT approach is also an excellent way of finding intermittent failures that occur in flight but do not duplicate under bench-ambient conditions. And the "retest OK" rate is a major problem, especially for avionics, where it sometimes runs as high as 85 per cent of all built-in-test failure indications.

Engineers sometimes tend to forget that the operational environment includes people. Man-machine interfaces still need attention, and this includes both operators and maintenance personnel. The interface between hardware and maintenance personnel is one of the things we mean by the term "maintainability"—and to make sure we do not leave it out, we are going to strictly limit the kinds of personnel-induced failures that can be declared "nonrelevant" during a reliability test. We also must take into consideration the work environment for maintenance people—and I'm delighted to see that some of the PRAM projects are focused on this very problem area.



F-111 aircraft availability of inflight doppler radar increased by 50 per cent after PRAM engineers found and fixed errors in maintenance technical orders.

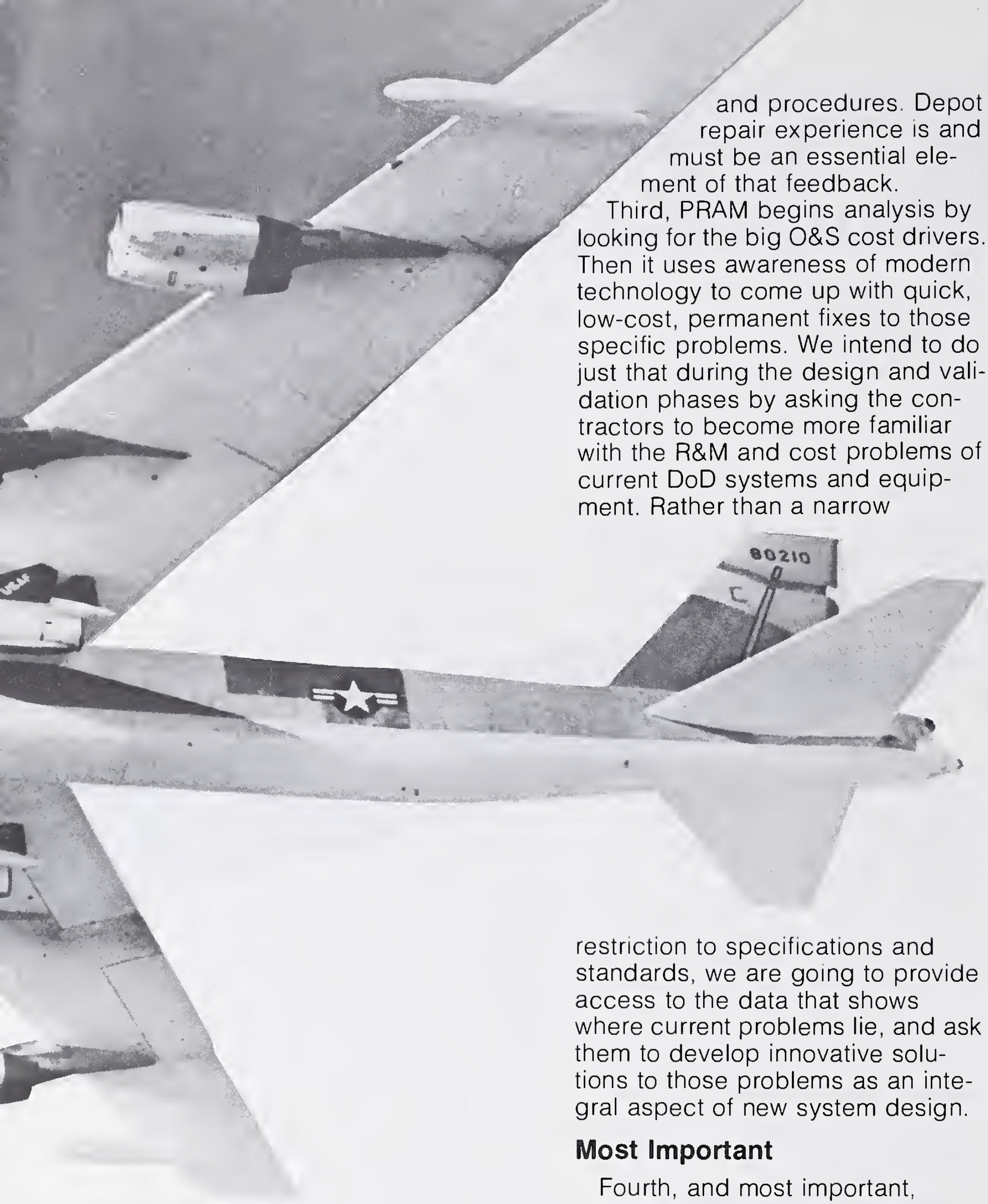
Engineers sometimes concentrate on hardware problems so much they overlook the problems caused by software and technical data. Under the new policy, failures caused by software errors will be counted as relevant, and so will maintenance manhours traced to errors in the prescribed maintenance procedures. In this context, I am reminded of the earlier PRAM project where inflight availability of the FB-111 doppler radar increased from 30 per cent to 80 per cent after PRAM engineers found and fixed some 3,000 errors in the maintenance technical orders. That is an excellent example of what we must do as a matter of policy.

Reliability and Maintainability

PRAM is not just another program; it is a concept, an attitude, a way of going after problems—almost a philosophy. So it is not only the specified "lessons learned" coming out of the PRAM program that we intend to use in reorienting reliability and maintainability efforts during other phases of acquisition; it is the basic principles by which PRAM operates.

First, PRAM defines reliability and maintainability in terms that relate to maintenance and logistics support costs. We have not always done that. In many cases, we have specified only mission reliability, which is a measure of operational effectiveness but has little relationship to O&S costs; and we have defined maintainability in terms of system downtime, thus excluding total maintenance manhours and material costs. The new reliability and maintenance (R&M) directive will correct several such oversights in current R&M technology, and thus facilitate quantitative performance/life cycle cost/effectiveness tradeoffs.

Second, PRAM gives first priority to field service experience, rather than theory or laboratory tests as a source of data. We are moving to tighten the feedback loops between field R&M and cost data from current systems and the requirements, design and testing of new systems. Military departments and Defense agencies will be required to provide participating contractors with relevant R&M and cost experience, through the program manager, as inputs to system design and the definition of realistic test conditions



Modern, off-the-shelf technology is being used in PRAM projects such as updating the fire control system for the B-52 tail turret.

and procedures. Depot repair experience is and must be an essential element of that feedback.

Third, PRAM begins analysis by looking for the big O&S cost drivers. Then it uses awareness of modern technology to come up with quick, low-cost, permanent fixes to those specific problems. We intend to do just that during the design and validation phases by asking the contractors to become more familiar with the R&M and cost problems of current DoD systems and equipment. Rather than a narrow restriction to specifications and standards, we are going to provide access to the data that shows where current problems lie, and ask them to develop innovative solutions to those problems as an integral aspect of new system design.

Most Important

Fourth, and most important, PRAM is placing emphasis on actually finding and fixing problems, rather than demonstrating that they exist and talking about them. This will be emphasized as the DoD policy for "test-fix-test" engineering development and "test-fix-test" production quality control. In engineering development, we will stress the use of "test-fix-test" to disclose latent R&M design deficiencies for correction prior to production. During the production phase, we will stress "test-fix-test" to disclose weak parts and manufacturing defects for correction prior to delivery. And we will cut back on much of the qualification or "proof of design" testing that we now require late in the acquisition process.

This approach is really common sense—or would be, if common sense were not unfortunately so rare. But we have benefitted from the practical demonstrations in which PRAM has shown that common sense will work if given a chance.

For example, I was especially interested in the PRAM-sponsored use of airless, electrostatic painting technology—not only because it is a more efficient way to do the job, but because it was an application of existing commercial equipment.

Commercial Practices

For some time now there has been a growing school of opinion that the Department of Defense could and should move more toward commercial practices in Defense acquisition. Following are a few areas where this is taking place.

First, we are urging a much greater use of non-Government standards. We are eager to adopt documentation already written, published and endorsed by the many voluntary standards bodies in the United States. To date we have adopted some 1,500 industry documents and plan to increase this many fold in the years ahead.

In recognition of the real cost reduction potential existing through the overall use of commercial items, we have given increased priority to a significant expansion of DoD use of commercial products. To this end, we have established the commercial commodity acquisition program (CCAP). CCAP is targeted to reduce or eliminate research and development time and costs by purchasing commercial products off-the-shelf wherever possible.

Standardization

Equally as important as the thrust toward commercial commodities is the attention we are devoting to standardization in our acquisition programs. One major initiative involves the area of specifications and standards. Charges of "goldplating" have been leveled at Defense systems for years, and more often than not the vast array of military specifications and standards has been cited as the culprit.

Furthermore a chronic complaint from industry has been that the military specifications and standards systems has not kept pace with technology and that the overapplication of military specifications and standards is driving costs upward. To get at this problem, the Defense Science Board chartered a task force about three years ago to look into the situation and make recommendations for corrections. The task force turned in its report in March 1977. The fundamental conclusion was that the current body of military specifications and standards is generally sound, and offers a considerable degree of flexibility and protection for DoD in its materiel procurement.

Nevertheless, it was determined that the people who call out these specifications and standards tend to apply them to their fullest measure, with insufficient consideration of the special requirements of the items being acquired. As a result, we often pay dearly for not using the flexibility deliberately embodied in these documents.

Of special note is the fact that the military standards on quality, reliability and maintainability are major drivers of acquisition cost and major culprits in the overall problem of overapplication.

We have embarked on a broad program to correct these problems throughout the Department of Defense. This program includes the provision of "tools" to facilitate the "tailoring" of specifications and standards in the near term, and a complete overhaul of the specifications and standards program in the longer term.

Quality Assurance

We also are paying more attention to quality assurance at higher management levels than we have in the past. This will include a far closer look at the quality of items that we reprocure and items used in product improvement of life extension programs. In too many cases, we have found a decay in overall parts quality after initial procurement. It does little good to design high reliability into a system, or to design it into a product improvement, if we do not make sure that the original parts quality is retained thereafter.

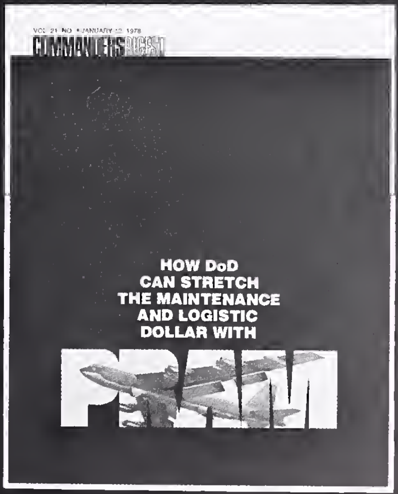
As one of several initiatives in the area of quality assurance, I have tasked a committee from the Defense Logistics Agency and the military Services to revise the regulation on reporting of defective material. The revision is expected to result in more effective techniques and standardization among the military departments and Defense agencies in reporting the discrepancies or failures found in field service.

It is planned that failure data from this system will be fed to the Government/Industry Data Exchange Program (GIDEP) Operations Center at Corona, Calif., but we have not yet worked out procedural details. The GIDEP Data Bank is financed by DoD and serves as an excellent source of parts and engineering data for use in design and development activities. When we get the procedural details worked out, it will allow DoD and industry better evaluation of failures and defects, and the conditions under which they occurred, so we can take the necessary corrective action.

Summary

In summary, many of the lessons being learned in the PRAM program are also being applied in earlier phases of system acquisition. In the same way, policies now being formulated for DoD material acquisition will influence the PRAM program. Initial development and subsequent life extension programs are not two separate worlds, and they must not be, because the problems and solutions are so similar.

Furthermore, PRAM may have an unexpected payoff in providing cost effective alternatives to satisfy mission deficiencies. Our recently re-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FLARE

WHO'S NEWS IN DEFENSE

Lt. Gen. Hill

Appointments

Dr. Seymour Lawrence Zeiberg, associate general manager, Advanced Programs Division, Aerospace Corporation, El Segundo, Calif., was appointed Deputy Under Secretary of Defense (Strategic and Space Systems) in the Office of the Under Secretary of Defense for Research and Engineering.

Maj. Gen. C. Emerson Murry, Army National Guard, of Bismarck, N.D., and **Maj. Gen. Billy M. Jones**, Air National Guard, of Atlanta, have been appointed to the Reserve Forces Policy Board, Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics), for three-year terms.

Dr. Robert Ross Fossum, Dean of Research and Dean of Science and Engineering, Naval Postgraduate School at Monterey, Calif., was appointed Director, Defense Advanced Research Projects Agency, succeeding Dr. George H. Heilmeier who has resigned.

Honors

Lt. Gen. Alton D. Slay, Deputy Chief of Staff, Research and Development, Headquarters, Air Force, won the 1977 Eugene M. Zuckert Management Award. He was cited for holding down R&D budgetary costs.

Reassignments

Lt. Gen. James E. Hill, vice commander, Strategic Air Command, has been reassigned to commander-in-chief, Aerospace Defense Command, and to commander-in-chief, North American Air Defense Command, with the approval of the government of Canada. He also has been nominated for promotion to general.

Maj. Gen. Edgar S. Harris Jr., USAF, Chief of Staff for the Strategic Air Command, will move up to vice commander-in-chief, Strategic Air Command. He has been nominated for promotion to lieutenant general.

Retirements

VAdm Edward W. Cooke, Deputy Chief of Naval Operations (Logistics), is to be placed on the retired list in grade.

vised acquisition policies require tradeoff studies of alternative solutions prior to the initiation of new weapon programs to meet mission needs. The process no longer excludes or deemphasizes the upgrade of an existing system. If in a PRAM-type effort we can envision a way to modify a present system so that capability, availability and efficiency are acceptable to fulfill the mission need, then that alternative may be selected as the winner.

The Air Force and the Congress are discussing whether PRAM should be funded from several different appropriations or entirely from within the R&D appropriation. Our position is this: We are willing to see PRAM funded with different kinds of money, but we are not willing to see it die, regardless of the kind of money involved. PRAM is too good a concept, with too high a return on investment, to let it slip through a crack while we decide which pocket the money should come from.

Finally, I would like to add just one word of caution. This PRAM idea must never get so "organized", or so top-heavy that it winds up strangling itself. We have seen too many good and needed ideas bog down that way. It must be kept flexible. It must be kept turning out fixes rather than paper. PRAM is a tiger team, and we need to make sure it stays that way.

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